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Hydrogen production by thermal water splitting using ferroelectric $PbTiO_3$ ARVIN KAKEKHANI, SOHRAB ISMAIL-BEIGI, Yale University — The increasing demand for renewable energy sources is a prominent challenge facing humanity in 21st century. In this regard, hydrogen production by splitting water has received great attention. Here, we theoretically propose a catalytic cycle that by leveraging the pyroelectric properties of ferroelectric $PbTiO_3$, and using a controlled temperature modulation around Curie temperature as a switch for surface chemical properties, can thermally split H_2O into O_2 and H_2. Since the Curie temperature of $PbZr_xTi_{1-x}O_3$ class of materials is tunable and usually in the range of 250-450 degree Celsius; the energy needed to drive this catalytic cycle can be provided by low/intermediate grade heat, for instance: geothermal, industrial waste heat or concentrated solar power. Since no precious metal is needed in this scheme, and all the elements are earth abundant, this can potentially become an economically viable method for hydrogen production.

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